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(54) Manufacture of tubular components.

(57) A method and apparatus for push-pointing a tube so as to produce a smaller diameter end portion includes means for sizing and finishing the reduced diameter portion utilizing a headed mandrel located in the tube and withdrawn through the reduced diameter portion whilst the latter is engaged in the push-pointing die. Figure 5 shows the push-pointing step completed, and the mandrel engaged with the die ready to begin the internal sizing operation.

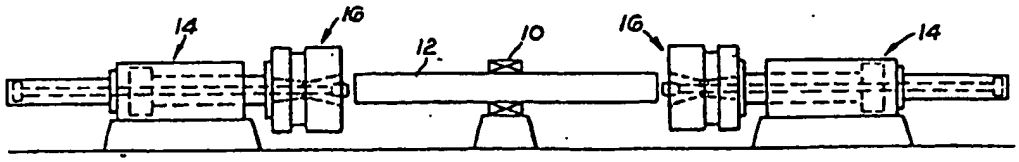

Fig. 1

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According to the present invention a method of making a stepped diameter tubular component comprises firstly introducing a headed mandrel into the interior of the untreated tube, secondly push-pointing the end of the tube to form a portion of reduced diameter, and then withdrawing the mandrel through the reduced diameter portion to size the interior.

By the cooperation of the push-pointing die used to form the exterior dimension of the stepped (reduced) portion with the mandrel head, both the interior and the exterior of the stepped portion can be drawn to finished size, and any, for example, weld bead on the inside of the reduced diameter portion can be cleaned off and removed.

It will be appreciated by those skilled in the art that the push-pointing die has a parallel portion of finite length, and the sizing of the internal diameter of the component is effected whilst the mandrel is within that portion. It is conventional to provide a push-pointing die with a wide angle mouth of frusto-conical formation having a large end which is of greater diameter than the untreated component so as to receive that end and guide it into the working portion of the tapered throat so afforded; followed by a relatively short axial length which is of uniform diameter, and then a relatively narrow angle frusto - conical portion behind that, so as to reduce frictional drag on the reduced diameter portion if a substantial length of the same - greater than the length of the uniform diameter portion of the die - is formed. For the purposes of the present invention however, at least in order to obtain maximum advantage and best sizing

other nd of the tube and the clamp is only a steady. The illustrations assume that both ends of a tube are to b treated, although not necessarily simultaneously, as hereinafter discussed. The apparatus shown is adapted for treatment at both ends by the provision of duplicated sets of displacement rams 14 and dies 16.

Figures 2 to 7 show only a single end of the machine for clarity, but as mentioned both ends will be the same. Referring now to Figure 2, each die comprises a major frusto-conical portion 18 with its larger end adjacent to the tube, a parallel portion 20 opening from the small end of the portion 18, and a tapered portion 22 which increases in diameter from the parallel portion to the opposite end of the die. The die is mounted on a ram 24 of hydraulic cylinder 26.

The die structure further includes mandrel 28 which may be somewhat barrel-shaped as shown preferably but not essentially having a uniform diameter portion of finite length generally mid-way along its axial length, the uniform diameter being the maximum diameter of the mandrel. The mandrel is mounted on a second ram 30 powered by a hydraulic cylinder 32. Ram 30 extends through ram 24. In accordance with a feature of the invention the two rams 24, 28 can be coupled by a lock 34. Appropriate hydraulic fluid flow control valves are provided to enable the rams to be displaced in either direction.

The method of the invention can now be described. Assuming that a suitable tub , die and mandr l are positioned in the apparatus and appropriat ly

some extent upon the natur of th tube nd th permissible tolerances so that usually both s ts of locked rams can be withdrawn tog ther to siz both ends simultaneously: but again alternate operation is possible if required.

The drawings illustrate a die with a parallel portion substantially equal in length to the uniform diameter portion mandrel to suit the simultaneous withdrawal technique described. However, one or other of the mandrel or die may have a uniform portion of infinite length. That is to say the mandrel may be wholly barrel-shaped or the two tapered portions in the die may meet without a parallel diameter portion.

Alternatively, the parallel diameter portion may be longer than illustrated in which event it may be possible for there to be relative movement between die and mandrel during the external/internal sizing operation. The simultaneous movement of the two over the tube is preferred to obtain maximum quality of finished tube sized both internally and externally.

Moreover, it is intended to be within the scope of the invention to size and finish the interior of the reduced diameter portion only, for which purpose relative movement of the mandrel and tube is required but not of the die.

Turning now to Figures 9 and 10, it will be seen that in the practical embodiment the dies and rams are arranged on a table 50 with ram cylinders 52 (for the ram 30) and 54 (for the ram 24) mount d on brackets 56 running on slideways to facilitat adjustm nt to s t up for particular dimensions. Th workpi c mount

CLAIMS

1. A method of making a stepped diam ter tubular component comprises firstly introducing a headed mandrel in the interior of the untreated tube, secondly push-pointing the end of the tube to form a portion of reduced diameter, and then withdrawing the mandrel through the reduced diameter portion to size its interior.

2. A method as claimed in Claim 1 which further comprises simultaneously sizing the interior and exterior of the reduced diameter portion, by withdrawing the push-pointing die simultaneously with the aligned mandrel to draw them through and over the tube.

3. A method as claimed in Claim 2 wherein the die and mandrel are locked together with the minimum diameter portion of the die and maximum diameter portion of the mandrel coincident, prior to the sizing operation.

4. A method as claimed in Claim 1 wherein both ends of the tube are treated and the push-pointing steps effective on the two ends take place alternately.

5. Apparatus for carrying out the method of Claim 1 comprising a push-pointing die having a frusto-conical push-pointing portion, and a headed mandrel, ram means for displacing the said die in a first direction to effect push-pointing, and ram means for displacing the mandrel in the opposite direction to effect sizing.

6. Apparatus as claim d in Claim 5 wh r in the die has a minimum diamet r portion of finite

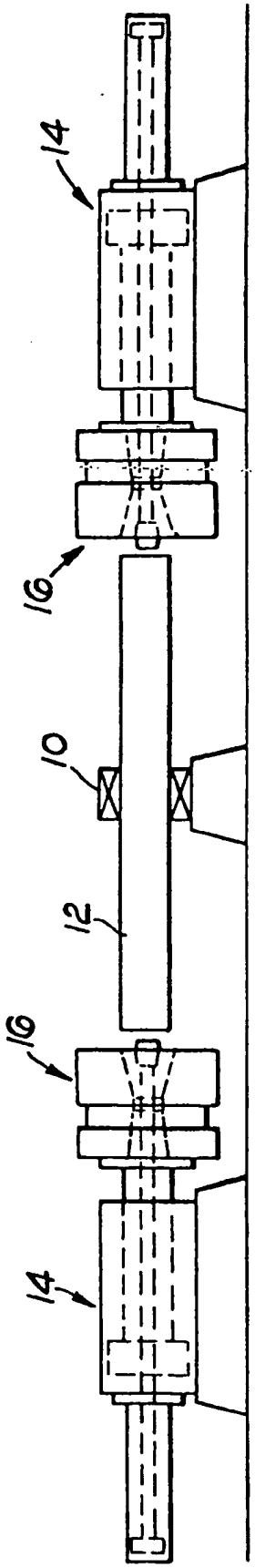

Fig. 1

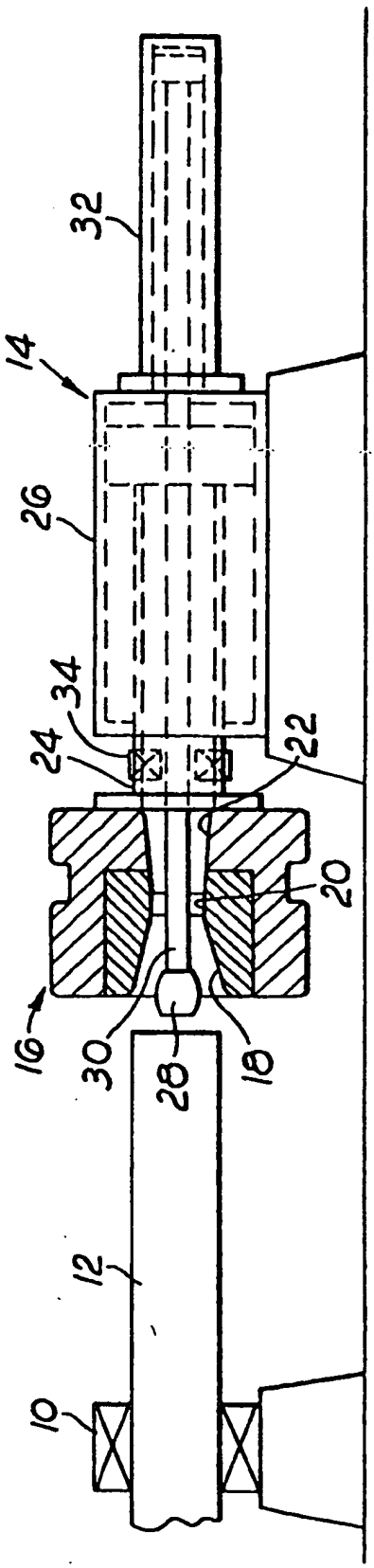

Fig. 2

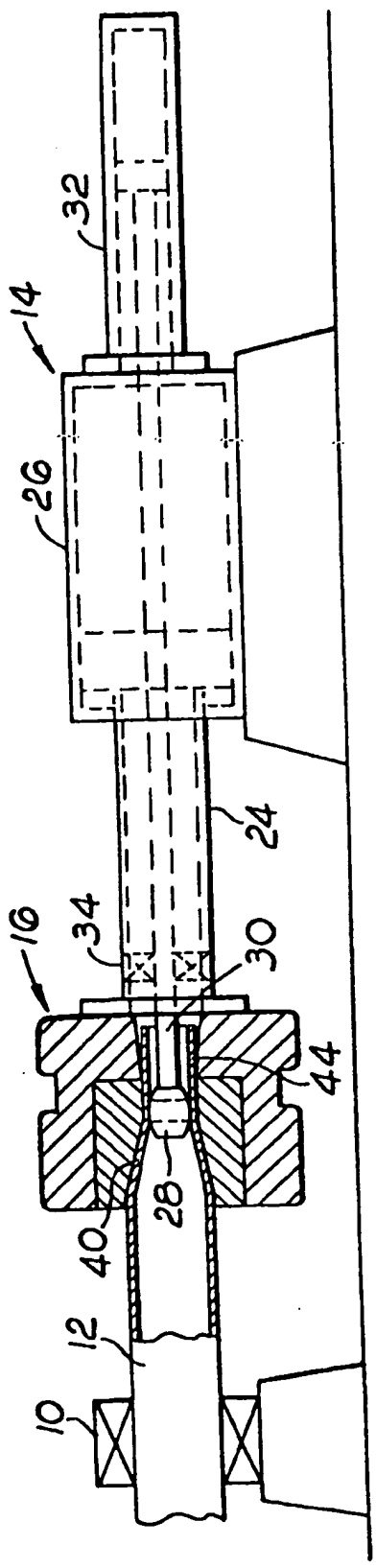

Fig. 5

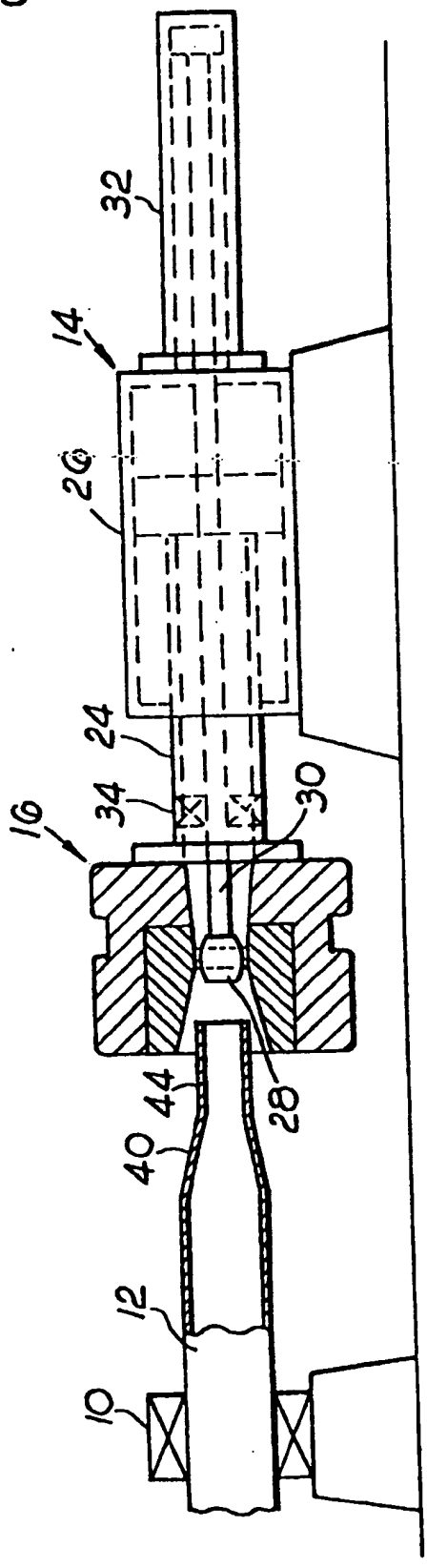

Fig. 6

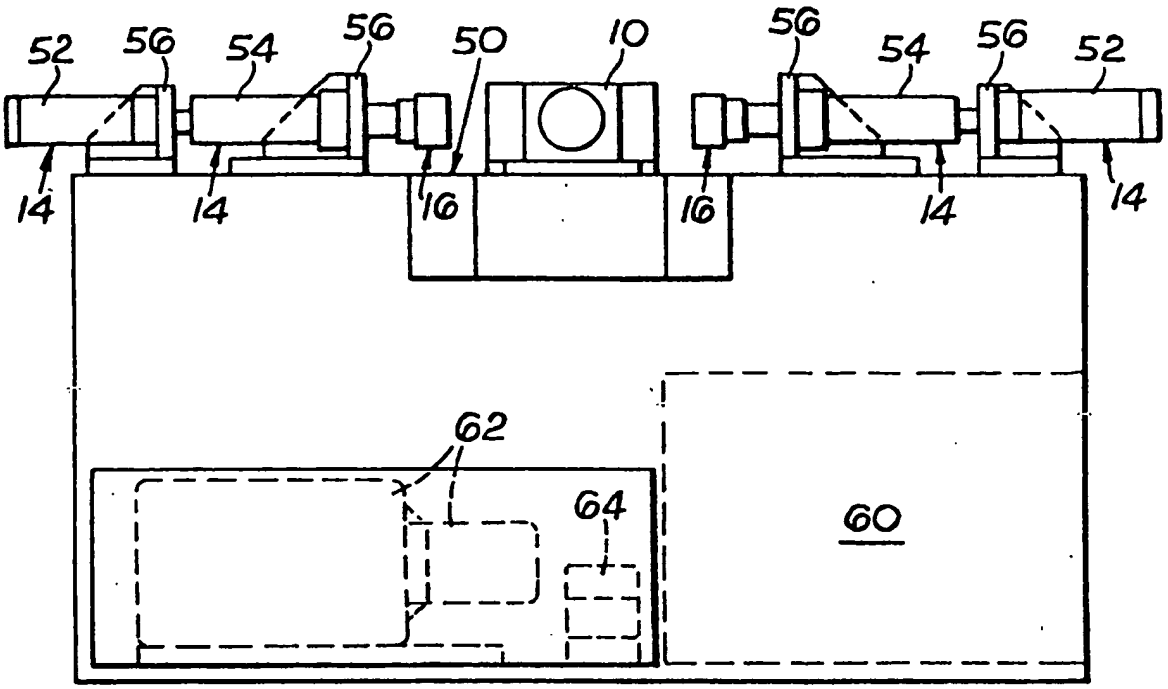

Fig. 8

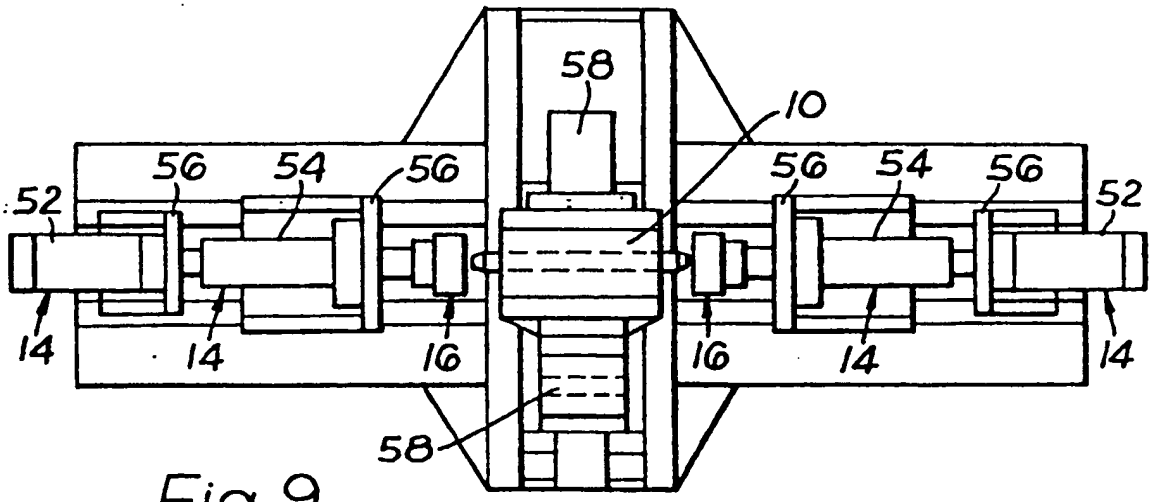

Fig. 9

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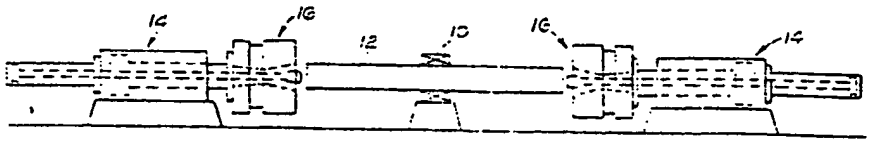

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